

CLAIMS

What is claimed is:

1. An optical pickup actuator for use with an objective lens on a base, comprising:
 - a bobbin holding the objective lens ;
 - a suspension having one end fixed on a side of the bobbin and another end fixed to a holder positioned on a portion of the base to allow the bobbin to be movable with respect to the base; and
 - a magnetic circuit, comprising:
 - a pair of unipolar magnets positioned on the base to face opposing sides of the bobbin,
 - a focusing coil wound around the bobbin,
 - a pair of tracking coils wound opposite one another and next to the objective lens in a radial direction to cross over the focusing coil and the bobbin to interact with the unipolar magnets to generate an electromagnetic force to control a tracking movement, and
 - a plurality of tilting coils positioned in an upper portion of the bobbin and/or in a lower portion of the bobbin and which interact with the unipolar magnets to generate an electromagnetic force to control a tilting movement when a central axis of the objective lens is disposed in an upward direction and a downward direction, the upward direction closer to an optical recording medium.
2. The optical pickup actuator of claim 1, further comprising a pair of reels formed on the bobbin to directly wind the tracking coils and/or the tilting coils, and the tracking coils and/or the tilting coils are directly wound around the reels on the bobbin.
3. The optical pickup actuator of claim 2, wherein the pair of the reels comprising a pair of first reels formed opposite one another and next to the objective lens in the radial direction on the upper portion of the bobbin to wind the tracking coils and the tilting coils, and the tilting coils are wound around the pair of the first reels.

4. The optical pickup actuator of claim 3, wherein the pair of the reels further comprising a pair of second reels formed opposite one another and next to the objective lens in the radial direction on the lower portion of the bobbin to wind the tracking coils and the tilting coils, and the tilting coils are further wound around the pair of the second reels on the lower portion of the bobbin.

5. The optical pickup actuator of claim 2, further comprising a mount spaced apart from the pair of reels formed on the bobbin to hold the objective lens so as to reduce an effect of heat on the objective lens.

6. The optical pickup actuator of claim 5, wherein the tracking coils and the focusing coil are installed on the bobbin so that effective coil portions of the tracking coils are positioned closer to the unipolar magnets than effective coil portions of the focusing coil.

7. The optical pickup actuator of claim 5, wherein the tracking coils and the focusing coil are installed on the bobbin so that effective coil portions of the of the focusing coil are positioned closer to the unipolar magnets than the effective coil portions of the tracking coils.

8. The optical pickup actuator of claim 5, further comprising a cavity formed in the bobbin to reduce a transmission of heat generated from the focusing coil, the tracking coils, and/or the tilting coils to the objective lens.

9. The optical pickup actuator of claim 1, wherein the tracking coils and the focusing coil are positioned on the bobbin so that effective coil portions of the tracking coils are closer to the unipolar magnets than effective coil portions of the focusing coil.

10. The optical pickup actuator of claim 1, wherein the tracking coils and the focusing coil are positioned on the bobbin so that effective coil portions of the focusing coil are positioned closer to the unipolar magnets than the effective coil portions of the tracking coils.

11. The optical pickup actuator of claim 1, further comprising a cavity formed in the bobbin to reduce transmission of heat generated from the focusing coil, the tracking coils, and/or the tilting coils to the objective lens.

12. The optical pickup actuator according to claim 1, wherein the magnetic circuit includes only a single pair of unipolar magnets.

13. The optical pickup actuator according to claim 1, wherein the actuator is a two-sided, three axis driving actuator.

14. An optical recording and/or reproducing apparatus for recording and/or reproducing information from an optical information storage medium, comprising:
an optical pickup, wherein the optical pickup comprises:
an actuator to actuate an objective lens movable in a radial direction of the optical information storage medium to record information on and/or reproduce information from the optical information storage medium; and

a controller to control focusing and tracking servo operations of the optical pickup, wherein the actuator comprises:

a bobbin holding the objective lens;

a suspension having one end fixed on a side of the bobbin and another end fixed to a holder positioned on a portion of a base to allow the bobbin to be movable with respect to the base; and

a magnetic circuit comprising:

a pair of unipolar magnets positioned on the base to face opposing sides of the bobbin,

a focusing coil wound around the bobbin,

a pair of tracking coils wound opposite one another and next to the objective lens in a radial direction to cross over the focusing coil and the bobbin to interact with the unipolar magnets to generate an electromagnetic force to control a tracking movement, and

a plurality of tilting coils positioned in an upper portion of the bobbin and/or in a lower portion of the bobbin to with the unipolar magnets to generate an electromagnetic force to control a tilting movement when a central axis of the objective lens is disposed in an upward direction and a downward direction, the upward direction closer to the optical information storage medium.

15. The optical recording and/or reproducing apparatus of claim 14,

further comprising a pair of reels formed on the bobbin to directly wind the tracking coils and/or the tilting coils, and the tracking coils and/or the tilting coils are directly wound around the reels on the bobbin.

16. The optical recording and/or reproducing apparatus of claim 15, wherein the pair of the reels comprising a pair of first reels formed opposite one another and next to the objective lens in the radial direction on the upper portion of the bobbin to wind the tracking coils and the tilting coils, and the tilting coils are wound around the pair of the first reels.

17. The optical recording and/or reproducing apparatus of claim 16, wherein the pair of reels further comprising a pair of second reels formed opposite one another and next to the objective lens in the radial direction on the lower portion of the bobbin to wind the tracking coils and the tilting coils, and the tilting coils are further wound around the pair of the second reels on the lower portion of the bobbin.

18. The optical recording and/or reproducing apparatus of claim 15, further comprising a mount spaced apart from the pair of reels formed on the bobbin to hold the objective lens so as to reduce an effect of heat on the objective lens.

19. The optical recording and/or reproducing apparatus of claim 14, wherein the tracking coils and the focusing coil are positioned on the bobbin so that effective coil portions of the tracking coils are closer to the unipolar magnets than effective coil portions of the focusing coil.

20. The optical recording and/or reproducing apparatus of claim 14, wherein the tracking coils and the focusing coil are positioned on the bobbin so that effective coil portions of the focusing coil are positioned closer to the unipolar magnets than the effective coil portions of the tracking coils.

21. The optical recording and/or reproducing apparatus of claim 14, further comprising a cavity formed in the bobbin to reduce transmission of heat generated from the focusing coil, the tracking coils, and/or the tilting coils to the objective lens.

22. The optical recording and/or reproducing apparatus according to claim 14, wherein the magnetic circuit includes only a single pair of unipolar magnets.

23. The optical recording and/or reproducing apparatus according to claim 14, wherein the actuator is a two-sided, three axis driving actuator.